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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 121403

Application Number: 09/699,396

Filing Date: October 31, 2000

Appellant(s): BAYYA ET AL.

John J. Karasek
For Appellant

EXAMINER'S ANSWER

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This is in response to the appeal brief filed 10/23/2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct:

The amendment after final rejection filed on 10/23/2003 has been entered.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

The rejections of claims 1, 3-8, 11-13, and 15-19 under 35 USC 112, first paragraph, are withdrawn in view of the following comments: The specification enables the coating of particles without reaction (e.g., coating with a solution of sodium phosphate to create a coating of sodium phosphate) or with reaction (e.g., using metal oxide precursors to form metal oxides). However, other reactions than those explicitly disclosed in the instant application are known, and it is the examiner's position that one of ordinary skill in the art, desiring to create the product of such a known reaction as a coating on a particle would reasonably be apprised by Applicant's specification of the possibility of applying the reaction precursor(s) to the particle by the claimed method and then performing the known reaction to form the desired product.

(7) *Grouping of Claims*

The rejection of claims 1, 3, and 13 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 3-8, 12, and 15-19 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 10 and 20 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) *ClaimsAppealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) *Prior Art of Record*

5,747,100	PETERSEN	5-1998
5,087,607	STROM et al.	2-1992
5,800,922	ANDERSON et al.	9-1998
5,609,911	OKABE et al.	3-1997
5,063,267	HANNEMAN et al.	11-1991
5,196,229	CHAU	3-1993
5,949,184	OHOSHI et al.	9-1999

Masters, K. Spray Drying Handbook, 4th edn.; John Wiley & Sons, New York, 1985.

(10) *Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

- I. Claims 1, 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petersen '100 in view of Strom '607, Anderson '922, and Okabe '911.

Claim 1 is representative of the claims and requires

A method for coating solid particles comprising the steps of

(a) adding solid particles to a liquid coating solution to form a liquid coating slurry containing a coating precursor, solvent for the precursor and the solid particles therein whereby the precursor material is not precipitated until after spraying,

(b) spraying the coating slurry to form droplets containing at least one particle,

(c) passing the droplets through a zone where the droplets are dried and form dry coated particles wherein the coating material is formed from the precursor material, and

(d) heat treating the coating material on the particles to remove volatile matter from the coating material.

Petersen '100 teaches

(a) adding solid particles to a liquid coating solution to form a liquid coating slurry (col. 6, lines 41-45) containing a coating precursor (e.g., salts of Zn, Ga, and Gd), dissolved in water (i.e., a solvent for the precursor) (col. 6, lines 23-37) and the solid particles (col. 6, lines 41-45);

(b), (c) spray drying (i.e., spraying the coating slurry to form at least some droplets that contain at least one particle and passing the droplets through a zone where the droplets are dried) to form particles coated with a coating material (col. 6, lines 45-47);

(d) heat treating the coating material to react the precursors to form a final coating material (col. 6, lines 50-62). The step must inherently remove any remaining solvent, as well as the reaction byproducts that do not form part of the oxide coating (that is, volatile matter).

Petersen '100 does not explicitly teach that the precursor material is not precipitated until after spraying. The process of Petersen '100 is a sol-gel process (col. 5, lines 36-45). '100 indicates that the coating solution is heated to increase the viscosity (col. 6, lines 35-41) before initiating the coating (e.g., spray drying) process. Applicant has argued that the increase in viscosity is caused by the gellation (i.e., precipitation) of the sol-gel mixture (see amendment filed 2/26/2003, paragraph bridging pp. 7-8), and the examiner agrees with this interpretation of the reference.

Strom '607, Okabe '911, and Anderson '922 are cited as evidence of what one of ordinary skill in the art would have understood regarding gellation in spray drying processes.

Strom '607 teaches a spray drying method in which particles of metal oxides are prepared from metal-containing precursors, such as metal nitrates (Examples) and that precipitation is avoided in the solution before spray drying by adding nitric acid to the solution (col. 21, lines 38-42). However, '607 does not discuss why precipitation is avoided.

In the background of Okabe '911, limitations of spray drying processes are discussed. Okabe '911 warns that in spray drying processes, coating uniformity may be adversely affected by gellation (col. 1, lines 35-39 and col. 1, line 65-col. 2, line 4). Also, Anderson '922 warns

that gellation of spray drying compositions may render the composition unpumpable (and therefore unfit for spraying) (col. 2, lines 13-30).

Therefore, taking the references as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have prevented any gellation or precipitation (e.g., via the precipitation-preventing method of Strom '607) in the slurry of Petersen '100 before spray drying in order to have avoided destroying the flow properties of the solution, and in order to have produced a more uniform coating for the reasons taught by Okabe '911 and Anderson '922.

II. Claims 3-8, 12, and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petersen '100, Strom '607, Anderson '922, and Okabe '911, as applied to claims 1 and 13 and further in view of Masters.

Claim 3 is representative of these claims and contains all the features of claim 1, and further recites that

- e) the temperature in the zone is elevated and the heat treatment of the coated particles is conducted at a temperature above the elevated temperature in the zone, and
- f) the precursor is selected from the group consisting of alkoxides, nitrates, sulfates, acetates, hydroxides, hydrates, chlorides, other precursor that can be dissolved in aqueous or non-aqueous liquids, and mixtures thereof.

Petersen '100, Strom '607, Anderson '922, and Okabe '911 are discussed above. f) Petersen '100 teaches that the precursors may be nitrates (col. 6, lines 23-28).

e) Petersen '100 does not teach that the spray drying occurs by spraying into a zone with an elevated temperature that is less than the reaction temperature. However, Masters teaches spray drying is typically performed by spraying into a heated atmosphere, wherein the application of heat aids the drying process (Masters, p. 3). Typical temperatures for the spraying zone are in the range of 90-125 °C (Masters, p. 30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have spray dried the particles of '100 into a heated zone at a temperature of 90-125 °C because Masters teaches that such heating aids in drying the particles, and teaches that such temperatures are operative for

spray drying. These temperatures are lower than the disclosed reaction (i.e., heat treatment) temperatures of 300-1000 °C disclosed by '100 (col. 6, lines 45-62).

III. Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson '100, Strom '607, Anderson '922, Okabe '911 and Masters, as applied to claim 3, above, and further in view of Hanneman '267 and Chau '229.

Claim 10 is representative of these claims, and requires the features of claims 3 and 5-8. Thus, the additional features of claim 10 beyond those of claim 3 above are

- g) particles less than about 50 microns in diameter (claim 5),
- h) temperature in the drying zone of 100-500 °C (claim 5),
- i) dilution ratio in the coating slurry of 200-3000 ml coating solution per gram of phosphor particles (claim 5),
- j) coating thickness of 2-200 nm (claim 5),
- k) droplet velocity in the drying zone of 1-50 cm/s (claim 5),
- l) residence time in the drying zone of 1-5 s (claims 5, 7),
- m) mixing a precursor solution with a diluent which is miscible with the precursor solution to form the coating precursor during droplet formation (claim 6),
- n) phosphor particles (claim 7),
- o) heat treating at 300-1500 °C over a period of 0.1-24 hours (claims 7, 8).
- p) the coating material is indium tin oxide, silicon dioxide, magnesium oxide, sodium phosphate, yttrium-europium oxide, and mixtures thereof; and
- q) the precursor is selected from the group consisting of indium methyl (trimethyl) acetyl acetate, tin isopropoxide, tetraethyl orthosilicate, magnesium nitrate, yttrium chloride, europium chloride, sodium phosphate and mixtures thereof.

Petersen '100, Strom '607, Anderson '922, Okabe '911, and Masters are discussed above. These further features of claims 5-8 are fairly taught by Petersen '100 and Masters for the following reasons:

Petersen '100 further teaches

g) a particle size of less than 50 microns (i.e., diameter of 3-10 microns) (col. 6, lines 47-50),

m) that the precursor material is mixed with urea, a water-soluble material (i.e., a material miscible with the solution) ('100, col. 6, lines 33-35).

n) that the particles to be coated are phosphors,

o) reaction (i.e., heat treating) temperature is 300-1000 °C, and the reaction time is less than 5 hours ('100, col. 6, lines 45-62).

j) Petersen '100 does not explicitly teach a coating thickness of 2-200 nm, but it does teach a coating thickness of less than 1 microns (1000 nm). Therefore, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

i, k, l) Petersen '100 does not teach particular dilution ratios, droplet velocities, or residence times for the spray drying process. However, the concentration of feed solids (i.e., the dilution ratio) is known to affect the coarseness of the spray, evaporation characteristics, and bulk density (Masters, p. 54). Likewise, the droplet velocity affects droplet size (Masters, pp. 54, 179, 213, 273-292). Residence time is known to affect the degree of moisture removal (Masters p. 55, 145-147, 151, 320-333). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized these variable through routine experimentation to have achieved desired droplet sizes and degrees of moisture removal because the determination of optimum or workable ranges of result-effective variables, such as these, represents mere routine experimentation to one of ordinary skill in the art. See MPEP 2144.05.II. and the cases listed therein.

Masters also teaches h) drying temperatures such as 125 °C, as discussed above regarding claim 3.

p-q) Petersen '100, Strom '607, Anderson '922, Okabe '911, and Masters. They do not explicitly teach that the coating material is indium tin oxide, silicon dioxide, magnesium oxide, sodium phosphate, yttrium-europium oxide, and mixtures thereof; and the precursor is selected from the group consisting of indium methyl (trimethyl) acetyl acetate, tin isopropoxide,

tetraethyl orthosilicate, magnesium nitrate, yttrium chloride, europium chloride, sodium phosphate and mixtures thereof.

However, Petersen '100 does teach that the formation of other oxide coatings (cols. 7-8). In particular, diffusion barriers prepared from a solution containing "ethyl silicate" by substantially the same method as the oxide coating process is described (col. 7, lines 1-34).

The teaching does not clearly indicate the diffusion barrier is formed from silicon dioxide, nor that tetraethyl orthosilicate is the particular ethyl silicate precursor used. However, one of ordinary skill in the art would have understood that Petersen '100 describes a decomposition reaction to form a silica (i.e., silicon dioxide) film because the context of Petersen '100 is the decomposition of metal precursor compounds to form metal oxide coatings on particles (See above.), because the formation of silica barriers via decomposition of silica precursors is well known in the art (See, for instance, Hanneman '267; col. 8, lines 28-54 and col. 10, lines 21-27), and because the formation of silica films by decomposition of ethyl silicates (in particular, tetraethyl orthosilicate (TEOS)) is known (See, for instance, Chau '229, Example 1). Therefore, taking the references as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used TEOS as the particular "ethyl silicate" of Petersen '100 to have formed a silica diffusion barrier coating because Hanneman '267 teaches that silica is a useful diffusion barrier material and because Chau '229 teaches that TEOS decomposes to form silica at temperatures within the disclosed treatment range of Petersen '100, col. 7, lines 6-10.

IV. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson '100, Strom '607, Anderson '922, Okabe '911, Masters, Hanneman '267, and Chau '229 as applied to claim 10, above, and further in view of Ohoshi '184.

Claim 11 requires the features of claim 10 and further that the particles are ZnS:Ag,Cl. Peterson '100, Strom et al. '607, Anderson '922, Okabe '911, Masters, Hanneman '267, and Chau '229 are described above, but do not explicitly teach that the phosphor is ZnS:Ag,Cl. However, Petersen '100 seeks to form phosphors for use in field emission displays (FEDs) (col. 1).

Ohoshi '184 teaches that fluorescent films of FEDs (col. 1, lines 1-10) may be formed from phosphors such as ZnS:Ag,Cl (col. 9, lines 38-51). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ZnS:Ag,Cl as the particular phosphor of Petersen '100 with a reasonable expectation of success because Ohoshi '184 teaches that ZnS:Ag,Cl is a suitable FED phosphor. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

(11) Response to Argument

I. Claims 1, 3, and 13

Applicant argues that the references do not teach the unexpected result of a particle lifetime of 10,000 hours of continuous operation without losing 50 % of the original brightness, which Applicant attributes to the feature of "the precursor is not precipitated until after spraying". The arguments are not commensurate in scope with the claims, which do not require a lifetime of 10,000 hours, and especially not commensurate in scope with claims 1, 3-6, 12-13, 15-17, and 19-20, which are not even limited to phosphor particles. Furthermore, the argument is unconvincing because Applicant's attribution of the feature to preventing precipitation before spraying is not supported by any showing of evidence. The only comparison in the specification is of coated phosphors to uncoated phosphors. Therefore, the asserted results do not represent a comparison to the closest prior art (Petersen '100) because Petersen '100 teaches a coated phosphor.

Applicant argues that the references do not suggest delaying precipitation *in order to attain the unexpected result*. (emphasis added by Examiner). The argument is not relevant because the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Anderson '922, and Okabe '911 teach that allowing gellation before spray drying may cause the nozzle to clog and Strom '607 teaches a particular method to prevent gellation before spray drying. Therefore, it would have been obvious to one of ordinary skill in

the art at the time the invention was made to have prevented gellation in order to have prevented the nozzle from clogging.

Applicant's arguments from p. 5, last paragraph to p. 8, first paragraph deal only with the Petersen reference. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). That is, the arguments are unconvincing because they do not address the motivation of Strom '607, Anderson '922, and Okabe '911 to prevent gellation.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that Strom, Anderson, and Okabe are nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Strom '607, Okabe '911, and Anderson '922 are cited as evidence of what one of ordinary skill in the art would have understood regarding gellation in spray drying processes. Thus, they are reasonably pertinent to the particular problem with which the applicant was concerned because they are cited for their general teachings regarding spray drying of gellable compositions, the particular problem with which Applicant was concerned (see Specification, p. 1, lines 3-9 and p. 13).

In particular, Applicant argues that Anderson is directed to alumina and that Okabe pertains to ceramic powder. The argument does not address the reason for which Anderson and Okabe are cited. Anderson is cited for its teachings at col. 2, lines 13-29 and Okabe is cited for its teachings at col. 1, lines 35-39 and col. 1, line 65-col. 2, line 4. These citations are merely

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representative that it is well known in the art of spray drying that teaches that gelling makes spray drying difficult. The further particulars of Anderson and Okabe would not have disguised this general teaching.

Likewise, Applicant states that Strom is directed to films. The argument does not address the reason for which Strom is cited. It is cited for its teachings at col. 21, lines 23-54, regarding a method for preventing the gellation before spray drying of a solution of precursors which are to be converted to metal oxides. Taken as a whole, Anderson, Okabe, and Strom warn of the difficulties of spray drying using gellable compositions and pose a solution to the known problem. The fact that Anderson, Okabe, and Strom do not coat particles with their particular spray drying compositions does not disguise the general teachings regarding the difficulties of spraying gellable coatings, which would have been relevant to the spray drying of the gellable coating of Petersen.

II. Claims 3-8, 12, and 15-19

In response to applicant's argument based upon the age of the references, contentions that the reference patents are old are not impressive absent a showing that the art tried and failed to solve the same problem notwithstanding its presumed knowledge of the references. See *In re Wright*, 569 F.2d 1124, 193 USPQ 332 (CCPA 1977).

Applicant argues that Masters does not teach delaying precipitation. The argument is unconvincing because it does not address the teachings of Strom, Anderson, and Okabe. Masters is cited merely for its general teachings regarding spray drying, the particular problem with which Applicant was concerned (see Specification, p. 1, lines 3-9 and p. 13). Applicant does not argue that Masters was inappropriately applied for these reasons.

III. Claims 10 and 20

Applicant argues that Hanneman and Chau do not teach delaying precipitation. The argument is unconvincing because it does not address the teachings of Strom, Anderson, and Okabe. Hanneman and Chau are cited merely for their teachings regarding the formation of silicon dioxide from tetraethyl orthosilicate precursors solutions, a particular problem with which Applicant was concerned (See specification, Example 2 and claim 10). Applicant does not argue that Hanneman or Chau was inappropriately applied for these reasons.

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IV. Claim 11

Applicant argues that Ohoshi does not teach delaying precipitation. The argument is unconvincing because it does not address the teachings of Strom, Anderson, and Okabe.

Applicant argues that Ohoshi is non-analogous art. The argument is unconvincing because Ohoshi is cited merely for its teachings regarding that ZnS:Ag,Cl is a suitable field effect device (FED) phosphors. The provision of FED phosphors is a particular problem with which Applicant was concerned (See Specification, pp. 2-3).

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



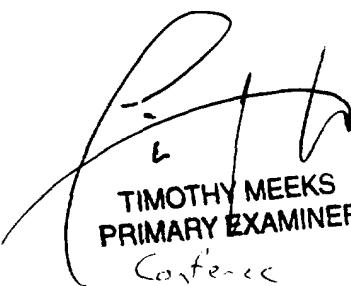
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